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MALDI-TOF MS: Potentialities and Applications on the Microbial Field

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Mass spectrometry (MS) has been available for *ca.* 50 years for the analyses of the molecular masses of compounds. However, the application to large biomolecules has been limited because of inherent low volatility and thermal instability. Such problems have been overcome by the development of the soft ionisation technology of Matrix Assisted Laser Desorption/Ionisation Time Of Flight Mass Spectrometry (MALDI-TOF MS). These emerged in the late of 80s as techniques for the ionisation of large proteins (Tanaka *et al.* 1988). The 2002 Nobel Prize for chemistry was awarded to Koichi Tanaka for the use of MALDI with biological macromolecules. Matrix-Assisted Laser Desorption/Ionisation Time-of-Flight Intact Cell Mass Spectrometry (MALDI-TOF ICMS) has been used experimentally for discriminating microorganisms based upon chemical compositional information alone, or by the use of multiple characters (the polyphasic approach). MALDI-TOF ICMS for the identification and classification of microorganisms needs statistical tools to enable comparisons of the unknown protein with reference molecular masses. Ribosomal proteins are used normally as reference molecular masses as they are the most abundant in the cells. Recent results, using MALDI-TOF ICMS for rapid and reliable microbial identification, show considerable promise (Santos *et al.* 2010). Furthermore, the technique is rapid, reliable and inexpensive in terms of labour and consumables when compared with other biological techniques. However, the full impact of this approach will only be appreciated when more diverse species are studied in detail. At present, it adds an additional step for polyphasic microbial identification which is essential when there is a paucity of characters for defining many species. However, even with the best polyphasic system, identification of some microbial taxa remains time-consuming and determining what represents a species remains subjective. This communication will focus the potentialities and applications of the MALDI-TOF MS and ICMS techniques from the chemical to the life sciences fields with particular attention to the microbial identification and microbial proteomics.

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